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CONTROL METHODS *for* PEACH INSECTS



GETTING RID OF THE PEACH TREE BORER.

NORTH CAROLINA
STATE COLLEGE OF AGRICULTURE AND ENGINEERING
AND
U. S. DEPARTMENT OF AGRICULTURE, COOPERATING
N. C. AGRICULTURAL EXTENSION SERVICE

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CONTROL METHODS FOR PEACH INSECTS

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THE SAN JOSE SCALE

San Jose Scale is prevalent throughout the state. It is an insect that is not generally recognized by the casual observer, and its injury, although very serious, is not striking in appearance. It is a serious pest of nurseries and young orchards, as when the infestation is heavy a young tree will be killed in from one to four years. In older trees the yield of fruit is greatly reduced and the trees weakened, thus making them more susceptible to other diseases and insects. In severe cases the scale will settle on the fruit, causing a reddish discoloration, often causing a shrinkage or deformity at the places attacked. This insect has the appearance of a scale as indicated by its name. It is small and inconspicuous, being about the size of the head of a pin, round and gray in appearance. A tree that is heavily infested is likely to have an unhealthy appearance and look as though sprinkled with fine ashes.

Control Measures—Winter Spraying

In order to secure the best control it is necessary to spray during the winter months, because if a spray of sufficient strength to kill scale insects is used any other time it will burn the fruit and foliage. If this concentrated spray is applied late (i. e., just before the buds are due to swell in the spring) it will help to control the peach leaf curl and the peach twig borer.

THE CONTROL OF THE CURCULIO

The curculio, the parent of the common "white worm" found in peaches, is one of the most destructive enemies of peaches in North Carolina. Its control, however, is not particularly difficult if sufficient care and precautions are taken. "Slipshod" methods will prove very disappointing. It is known that the adult curculio spends the winter—hibernates—in the trash and grass in or around the orchard, or in the neighboring woods. Thus it is advisable to clean up and burn the trash in and around the orchard, and in this way destroy many of the adults that would emerge in the spring. It is known that the curculio after emerging in the spring feeds some on the young buds, but to a much greater extent feeds on and "stings" (lays eggs in) young fruit, many of which drop to the ground. Therefore, the principal control measures are based on poisoning and picking up and destroying the "drops."

Much of the fruit that has been "stung" by the curculio drops to the ground. On this fruit, the worm (young curculio larva) develops, then enters the ground to pupate and later emerge as an adult curculio ready to "sting" the developing fruit still remaining on the trees. Therefore it is important to pick up and DESTROY the "drops" twice a week EARLY in the season; later it is not as effective.

On the spray schedule on page 4 the addition of arsenate of lead to sprays Nos. 2, 3 and 4, is particularly for the control of the curculio. These sprays when thoroughly and carefully applied should give satisfactory control. However, strict attention must be paid to the time of application and to thoroughness of application.

SPRAY SCHEDULE

No.	TIME OF APPLICATION	MATERIAL TO USE
1	Dormant Season	Standard strength (32° Baume) concentrated lime-sulphur. Dilute 8. Lubricating-oil emulsion if scale is bad. (See directions for preparation.)
2	When 75% of the petals (pink part of flower) have fallen.	One pound powdered Arsenate of Lead plus lime water from three pounds stone lime, to each 50 gallons of water.
3	When calyces or "shucks" are shedding, or when small peaches are exposed.	One pound powdered Arsenate of Lead plus lime water from three pounds stone lime, to each 50 gallons of water.
4	Two weeks after 3rd application or about four weeks after the petals have been shed.	Self-boiled lime-sulphur 8-8-50 alone. Arsenate of Lead in this application. Dry-mix can be used instead of self-boiled lime-sulphur.
5	Four weeks before each variety is due to ripen.	One pound powdered Arsenate of Lead to each 50 gallons of 8-8-50 self-boiled lime-sulphur. Dry-mix can be used instead of self-boiled lime-sulphur.

Early varieties should be sprayed three times. Use materials recommended for 2nd, 3rd and 5th applications using them at the time indicated. Self-boiled lime-sulphur, or dry-mix should also be used in the 3rd and last application as protection against brown rot.

DUST SCHEDULE

No.	TIME OF APPLICATION	MATERIAL TO USE
1	Dormant Season (Spray)	Standard strength (32° Baume) concentrated lime-sulphur dilute 1 in 10. Lubricating-oil emulsion if scale infestation is severe.
2	When 75% of the petals (pink part of flower) have fallen.	Arsenate of Lead 5%. Lime 95%.
3	When calyces or "shucks" are shedding, or when small peaches are exposed.	Arsenate of Lead 5%. Lime 95%.
4	Two weeks after 3rd application or about four weeks after petals have been shed.	Sulphur 80%. Arsenate of Lead 5%. Lime 15%.
5	Four weeks before each variety is due to ripen.	Sulphur 80%. Arsenate of Lead 5%. Lime 15%.

For early varieties make first two applications as indicated by the schedule, but use sulphur (80-5-15) in 3rd and 5th applications. The 4th application is omitted on early varieties. Better results will be obtained by applying the dormant spray as a delayed dormant spray just before the buds swell in the spring.

PEACHES

PESTS	REMARKS
Scale and Leaf Curl.	If orchard is badly infested with scale, one of the oil sprays should be made before buds swell in spring otherwise use concentrated lime-sulphur.
Curculio	This spray is very important in control of Curculio and should not be delayed after 75% of the petals fall.
Curculio	Also important in control of Curculio. Care should be exercised in properly timing the spray.
Scab and Brown Rot.	Arsenate of Lead is omitted in this spray as there is very little activity of Curculio during the stone hardening period of the peach.
Curculio, Scab and Brown Rot.	Activity of Curculio is resumed at this time, making Arsenate of Lead necessary. Very important brown rot spray and should be carefully timed.

ing early varieties. Better results will be obtained by applying the dormant spray as a dormant dormant spray just before the buds swell in the spring.

NOTE: This schedule compiled by G. W. FANT, Pathologist, and C. H. BRANNON, Asst. pathologist.

PEACHES

PESTS	REMARKS
Scale and Leaf Curl	If orchard badly infested with scale, one of oil sprays should be made before buds swell in spring, otherwise use concentrated lime-sulphur.
Curculio	It is not necessary to use sulphur in this application, although the regular formula (80-5-15) may be used if desired.
Curculio	It is not necessary to use sulphur in this application although the regular formula (80-5-15) may be used if desired.
Scab and Brown Rot	This application is very important in control of Scab and Brown Rot.
Curculio, Scab and Brown Rot.	This application is very important in control of Curculio, Brown Rot and Scab.

NOTE: This schedule compiled by G. W. FANT, Pathologist, and C. H. BRANNON, Asst. pathologist.

OTHER METHODS OF CONTROL

PICKING UP "DROPS":

"Drops" begin to fall from the trees soon after the "shucks" are shed. Usually between 75% to 100% of these small peaches that fall from the trees after the fruit is set, contain larvæ or "worms" of the Curculio.

These "drops" should be picked up at frequent intervals and destroyed. This will greatly reduce the number of Curculio of the second generation and its importance cannot be over emphasized. After the drops are picked up they should be buried in a trench at least two feet below the surface of the ground and covered with quick lime.

This method of control is just as important as spraying or dusting and should be ranked as a major control measure. Care should be observed to pick up the small, hard drops as they are especially likely to contain more "worms."

DISKING:

Disking should be done in the orchard by use of extension disk, soon after the fruit is set and continued at frequent intervals until harvest. The orchard should be disked at least once a week. In this way many of the pupæ of Curculio will be destroyed and worms exposed to heat and predaceous enemies.

THE CONTROL OF THE FRUIT TREE BARK BEETLE

If some of the limbs of your peach trees look as though they had been struck with a charge of fine shot, it would probably indicate that they were being injured by the fruit tree bark beetle. Usually sap or gum may be seen exuding from the fine holes. The holes are caused by the exit of small adult beetles and by their later entrance to lay eggs. The young or larvæ burrow beneath the bark. About a month is required for each generation, there probably being about three generations a season in North Carolina.

It will be observed that the injury occurs on trees that are in an unhealthy condition due to scale, borer or some other condition.

Knowing that these insects prefer sickly trees, our most important factor in control is to keep the trees in a vigorous and healthy condition by proper fertilization, cultivation, and keeping them free from disease and other injury by a well carried out spraying schedule.

Keep all the dead and diseased wood pruned out and burned. If the orchard is well pruned, vigorous and healthy, little or no injury will be noticed from the fruit tree bark beetle.

Where trees are badly infested and immediate measures are necessary, trees of stone fruits like peach, plum and cherry may often be saved by the prompt application of remedies. The trees should be first cut back severely and fertilized and cultivated liberally. This will stimulate the growth and help the tree in overcoming the injury. A thick coat of whitewash can then be applied to the trunk and larger limbs. It will stick better if a handful of table salt is added to each bucketful. This should be applied at least three times during the season: once in early spring, in mid-summer, and in the fall.

This whitewash will not kill the insects already in the trees, but if it is thoroughly done, it will in a large measure prevent additional eggs being laid and will help the trees, with the aid of cultivation and fertilizer, to more speedily recover from the injury.

DIRECTIONS FOR PREPARING SPRAY MATERIAL

DORMANT SPRAYS

CONCENTRATED LIME-SULPHUR:

There are two formulæ in general use, the first will produce a highly concentrated material testing 32° to 34° Baume.

Formula I

Stone Lime.....	80 lbs.
Sulphur (commercial ground).....	160 lbs.
Water, to make finished product.....	50 gals.

The second formula is perhaps most important among those who make their solution on the farm. This solution will test from 27° to 28° Baume.

Formula II

Stone Lime.....	50 lbs.
Sulphur (commercial ground).....	100 lbs.
Water, to make finished product.....	50 gals.

DIRECTIONS FOR PREPARING CONCENTRATED LIME-SULPHUR

Heat 15 to 20 gallons of water in the container in which the boiling is to be done. Add the lime and while slaking is taking place add enough water to the sulphur to make a thin paste free from lumps. Water should be added from time to time to prevent burning of the lime.

Sulphur should be added when the slaking is well under way or promptly at the conclusion of the slaking. The full quantity of water should then be added (hot water) to bring the total quantity to volume called for in formula, *care should be exercised in keeping the quantity up to total volume during the cooking.*

Experience has shown that the mixture will require about fifty minutes of continuous boiling before a complete solution is obtained. Agitation should be thorough and continuous from the start. The boiling should be accurately timed or an over boiled or under boiled solution will be produced. The concentrate should be strained with twenty mesh strainer (brass or tinned iron—*not* copper) before being placed in barrel or spray tank. The lime-sulphur should be tested when it is cool and the figures marked on the barrel so that proper dilution can be made and should also be tested after being diluted in spray tank with a highly accurate spray meter.

LIME: High grade, freshly burned stone lime testing at least 90% Calcium should be used in liquid sprays. Lime should not contain over 5% Magnesium. Magnesium oxid forms insoluble compounds, which increases sediment. Only hydrated lime should be used in dust mixtures.

CAUTION: Concentrated lime-sulphur should never be applied to peach trees during the growing season.

LUBRICATING OIL EMULSION

Lubricating-oil emulsions have proved especially effective in the control of scale on dormant peach trees. Where scale infestation is severe growers are advised to clean up the orchard with a lubricating oil emulsion spray. These oil sprays have been used consecutively for years on the same peach trees and no injury to any part of the trees has resulted. Both home-made and proprietary products have proved effective. Prepared oil emulsion sprays can be purchased from insecticide dealers.

BOILED FORMULA:

Red Engine oil, or oil of similar grade.....	1 gal.
Water	½ gal.
Potash-fishoil soap.....	1 lb.

The oil, water and soap should be placed in tank or kettle and boiled for a few minutes. A brown scum will appear on the surface. When this scum disappears the heat should be cut off. While the mixture is still hot it should be pumped twice under pressure of 60 lbs. The emulsion should be used shortly after it is prepared.

A power sprayer can be used to emulsify the oil by pumping into the tank then back into the cooker or into barrels. To prepare on a large scale, live steam should be used for cooking and a steam pump used.

COLD PUMPED FORMULA:

Red Engine oil, or oil of similar grade.....	1 gal.
Water	½ gal.
Calcium Caseinate.....	2 oz.

Make a thin paste of the Calcium Caseinate then pour into barrel containing water and mix thoroughly. Pour the oil into the barrel containing water and Calcium Caseinate and stir thoroughly. Place suction hose in barrel and start engine. When pressure reaches 250 pounds, suction should start. The material can be sucked through the pump and out thru the spray rods with discs removed. This emulsion should be drawn through the pump at least three times. Fresh batches should be made each day.

Good results have been secured in U. S. Bureau of Entomology, Fort Valley, Georgia, by using 6 gallons of the stock emulsion to 194 gallons of water where scale infestation is moderate. Where scale infestation is heavy use 9 gallons of the stock emulsion to 191 gallons of water.

If the soap emulsion breaks down in hard water, add Bordeaux mixture (¼-¼-50) to the water before the stock emulsion is added. The caseinate emulsion should give no trouble in either hard or soft water.

Oils of either paraffin or asphaltum base may be used.

SUMMER SPRAYS

SELF-BOILED LIME-SULPHUR:

Place eight pounds of stone lime in a 50 gallon barrel and slake with hot water. As soon as slaking starts add eight pounds of sulphur made into a thick paste. Stir continually and add water to prevent burning, but too much water will drown the lime and cause the slaking to stop too soon. After the mixture has boiled about five minutes (longer if poor grade of lime used) cool it with water, strain into spray tank and add enough water to make 50 gallons.

Care should be observed to cool the mixture before red streaks appear to any extent as this is an indication of overheating.

Self-boiled lime-sulphur cannot be stored. It should be used immediately after preparation. It should be diluted properly before Arsenate of Lead is used in combination sprays.

DRY-MIX SULPHUR-LIME:

Dry-mix is growing widely in use because of the many advantages of this material. It has better sticking qualities than self-boiled lime-sulphur and it satisfactorily controls scab and brown rot. It is also cheaper and easier to prepare.

DRY-MIX FORMULA:

Finely Powdered Dusting Sulphur.....	5 lbs.
Hydrated Lime.....	7 lbs.
Calcium Caseinate.....	$\frac{1}{2}$ lb.

PROPORTION TO USE:

Dry-mix should be diluted with water 8 pounds to 50 gallons of water, 32 pounds to 200 gallon tank. The material should first be poured thru a mesh sieve to remove lumps which would clog the spray nozzles. The material for the entire season's operations may be prepared before season opens. Dry-mix will not deteriorate in storage if kept dry. The materials should be mixed thoroughly. A dust mixer should be used if possible. A barrel mixer can be easily made or the mixing can be done in a tank with shovel and hoe.

ARSENATE OF LEAD:

A finely powdered Arsenate of Lead should be used in proportion of 1 pound to 50 gallons of water as a spray. This should be made into a thin paste and lime water from three pounds of stone lime added before it is put into spray tank.

SULPHUR:

A very finely pulverized, commercial ground, sulphur should be used for sprays. Sulphur should be 98% to 99% pure and this grade can be readily obtained.

DUSTING MATERIALS:

All dusting materials should be very fine and thoroughly mixed. A very fine Arsenate of Lead and superfine sulphur, guaranteed 95% to pass 200 mesh sieve, should be used. Hydrated lime should be used for all dust mixtures.

Spray or dust thoroughly and use the best materials.

CONTROL OF PEACH TREE BORER BY THE USE OF PARADICHLOROBENZENE

Paradichlorobenzene has proved very effective in the control of the peach tree borer. If this material is applied in the right manner and at the proper time 90% to 100% control can be expected. This method of borer control has been thoroughly tested and growers are advised to use it regularly each year.

AGE OF TREES: In the experience of the U. S. Bureau of Entomology, Fort Valley, Georgia, paradichlorobenzene can be used on trees four years of age

and older with safety. However, if two- and three-year-old trees are badly infested, one-half ounce of paradichlorobenzene can be used with slight chance of injury to the trees.

SIZE OF DOSE: For trees four and five years of age three-fourths of an ounce of paradichlorobenzene should be applied to each tree. For trees six years of age and older a full ounce of the chemical should be applied. For very old trees with large trunks an ounce and a fourth of paradichlorobenzene should be applied.

WHEN TO APPLY: Paradichlorobenzene should be applied between September 25 and October 10, in North Carolina. This date of application must be closely followed if best results are to be obtained.

PREPARATION OF THE SOIL

Very little preparation of the soil is necessary other than breaking the crust with a hoe and smoothing it off, or to remove weeds and grass. *Care should be observed to place dirt around the trees if the topmost borer hole is above the surface of the soil.* The gas given off by paradichlorobenzene is heavier than air and will not penetrate borer holes above the point of application of the chemical.

HOW TO APPLY: Scrape away gum from trunk of tree and make the soil level and apply the crystals in a continuous ring about an inch wide and about an inch from the trunk of the tree. The crystals should not be placed too far from the tree and care should be observed to avoid pushing the crystals against the trees. Several shovels of dirt should be placed over the crystals and packed in a mound with the back of the shovel.

LATER ATTENTION TO MOUNDS: Growers are advised to tear down the mound around four and five year old trees a month after application of paradichlorobenzene. Mounds around older trees should be treated likewise six weeks after date of application. This is to remove unspent crystals and allow the gas to escape.

GRADE OF MATERIAL: Growers should specify a grade of pure paradichlorobenzene about the fineness of granulated sugar. This material can be secured from insecticide dealers.

ORIENTAL PEACH MOTH

The Oriental Peach Moth has been recently established in North Carolina. This insect was introduced into the United States probably from Japan about ten years ago and is now established over a wide area in the United States and Canada. The Oriental Peach Moth is capable of causing severe damage ranging from 2% to 90% depending upon various environmental conditions. However, only slight injury has resulted thus far in North Carolina.

Entomologists state that the Oriental Peach Moth has five or six generations in North Carolina. This insect passes the winter in the larval stage, sealed in a cocoon. These cocoons are attached to the bark of the old trees around the base of trees, or to bits of trash on the ground about the orchard.

Larvæ pupate and emerge as adults in the spring about blossom time. Eggs are placed on the under surface of the leaves.

Larvæ or "worms" of the first and second broods bore into the young growing shoots of the tree. Later broods feed in the fruit. As soon as the young shoots, which the larvæ has entered, wilt and begin to dry, the larvæ seek fresh shoots or enter the fruit. Often the larvæ enters the fruit through the stem making it difficult to determine infestation without cutting into the fruit.

CONTROL

satisfactory control measures have yet been devised. The larvæ has a peculiar habit of discarding outside tissue when eating into stems or fruit, therefore, arsenicals are of little or no value. The use of paradichlorobenzene against peach tree borer kills a great many of the larvæ in cocoons around the bases of the trees. Late fall or early spring plowing, to cover cocoons in the ground, is the only control measure that can be recommended at this time.

**DILUTION TABLE FOR CONCENTRATED LIME-SULPHUR
SOLUTION FOR DORMANT SPRAY**

Baume Tests of Concentrate	Rate of Dilution	AMOUNT IN GALLONS TO USE FOR			Baume Tests of Diluted Solution
		50 Gallon Tank	100 Gallon Tank	200 Gallon Tank	
35	1 in 9	5½	11	22	4
34	1 in 8¾	5¾	11½	23	4
33	1 in 8¼	6	12	24	4
32	1 in 8	6¼	12½	25	4
31	1 in 7½	6¾	13½	27	4
30	1 in 7¼	7	14	28	4
29	1 in 6¾	7½	15	30	4
28	1 in 6½	7¾	15½	31	4
27	1 in 6	8¼	16½	33	4
26	1 in 5¾	8¾	17½	35	4
25	1 in 5¼	9½	19	38	4
24	1 in 5	10	20	40	4
23	1 in 4½	11	22	44	4
22	1 in 4¼	11¾	23½	47	4

